

I. The Rejection Under 35 U.S.C. §103(a)

Claims 1-15 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Yamauchi et al., US 5,788,786, taken with Thurn et al., US 3,873,489.

Applicants respectfully submit that the present invention is not obvious over Yamauchi et al in view of Thurn et al and request that the Examiner reconsider and withdraw this rejection in view of the following remarks.

Neither Thurn nor Yamauchi express the distribution of sulfur groups in the linkages of their silane coupling agent compounds.

In every one of the specific examples, Yamauchi uses Si69 (manufactured by degaussa) as the silane coupling agent. See Tables 1 and K2 of Yamauchi and "silane coupling agent 5)." The distribution of sulfur groups in the linkages of Si69 is not within the scope of the distribution of sulfur groups in the linkages of Applicants' claimed silane coupling agents. See the distribution of sulfur groups in the linkages of Si69 in Table 1, page 14 of Applicants' specification.

Si69 is used as the comparative example Sample A in Table 1 of the present specification. Si69 is different from the claimed silane coupling agent of the present invention in that, in Si69, components having sulfur chains of -S₅- or more, i.e., high polysulfide silanes, are included in an amount of 50% or more.

When carrying out mixing at low temperatures, 150°C or less, and preparing a rubber composition using a silane coupling agent with a large amount of high polysulfide silane, the rubber composition does not show sufficient abrasion

resistance for a tire. This is evidenced by Example 2, Table 2 of Applicants' specification.

On the other hand, when mixing at high temperatures, 150°C or higher, and preparing a rubber composition using a silane coupling agent with a large amount of high polysulfide silane, gelation of the polymer (the high polysulfide silane) occurs, which results in an undesirable increase in the Mooney viscosity. (See the discussion in Applicants specification, page 4, lines 7-17 and page 9, line 10 through page 10, line 16). For example, in Comparative Example 4 of Applicants' specification, Sample A was mixed at high temperatures, and, due to the high Mooney viscosity, the rubber compound could not be extruded and a tire could not be manufactured. See the Mooney viscosity index data of Comparative Example 4, Table 2, page 19 of Applicants' specification and the last three lines on the bottom of page 19.

Accordingly, it is clear that the rubber composition of Yamauchi using Si69 cannot be processed by mixing at high temperatures.

Thurn, like Yamauchi, differs from the present application in that there is no disclosure of the distribution of the number of sulfur atoms in the silane coupling agent, nor any disclosure of the importance of the distribution of the silane coupling agent.

Further, Thurn does not make any mention of effects of polybutadiene rubber. For the reasons outlined in the first paragraph on page 2 of the present

specification, in order to achieve a satisfactory snow/ice grip performance, the amount of polybutadiene must be restricted.

All of the Examples of Thurn contain 100% natural rubber. Comparative Example 6 of the present application contains 90% natural rubber, and is thus similar to the Examples of Thurn. Further, it is submitted that 90% natural rubber and 10% polybutadiene rubber would be closer in scope to Applicants' claims than 100% natural rubber.

Examples 5-7 of the present application only differ from Comparative Example 6 of the present application with respect to the rubber compositions thereof. Accordingly, by comparing the properties of the rubber compositions of Examples 5-7 with Comparative Example 6, the unexpected differences between the present invention and the invention of Thurn can be clearly seen.

When preparing a tread of a pneumatic tire including a closed cell rubber composition if the amount of polybutadiene is low, the snow/ice grip performance and the abrasion resistance are poor. See the closed cell rubber composition of the present invention shown in Table 3, page 20. Accordingly, if the amount of polybutadiene is not within the range recited in Applicants' claims, the objects of the present invention cannot be achieved.

Further, unlike the present invention, Thurn includes no disclosure with regard to mixing at high temperatures, nor any disclosure with regard to a rubber composition including closed cells.

The claimed distribution of the silane coupling agent of the present invention is not disclosed in any of the cited references. Because high polysulfide silanes lead to an increase in the Mooney viscosity, they are not preferable. Further, a silane coupling agent made of S₂ does not contribute to the coupling ability and is therefore not preferable. See comparative silane coupling agent Sample F which consists primarily of S₂ and see the properties of Comparative Example 5 in Table 2 which was prepared from Sample F.

As discussed above, Applicants claimed invention, containing a silane coupling agent having a specific distribution, unexpectedly provides an excellent rubber composition which does not present problems when either mixing at high temperatures or mixing at low temperatures is carried out.

In addition to the comparative data of the specification discussed above, the Examiner's attention is also directed to the attached Declaration Under 37 C.F.R. §1.132.

The §132 Declaration includes additional comparative experimentation to demonstrate the unexpected superiority of Applicants' claimed invention, including the claimed distribution of sulfur atoms in the silane coupling agent. As seen in the table of page 6 of the §132 Declaration, Inventive Sample B, made from a rubber composition using a distribution of sulfur atoms in the silane coupling agent within the scope of Applicants' claims, unexpectedly has a superior Mooney viscosity and improved abrasion resistance over the rubber composition of Sample G, which

contains a silane coupling agent with a distribution of sulfur atoms outside the scope of Applicants' claimed distribution.

For the above reasons, it is respectfully submitted that the subject matter of claims 1-16 is neither taught by nor made obvious from the disclosures of Yamauchi et al or Thurn et al, either alone or in combination, and it is requested that the rejection under 35 U.S.C. §103(a) be reconsidered and withdrawn.

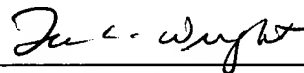
II. Conclusion

In view of the above, Applicants respectfully submit that their claimed invention is allowable and ask that the rejection under 35 U.S.C. §103 be reconsidered and withdrawn. Applicants respectfully submit that this case is in condition for allowance and allowance is respectfully solicited.

If any points remain at issue which the Examiner feels may be best resolved through a personal or telephone interview, he is kindly requested to contact the undersigned at the local exchange number listed below.

Applicants hereby petition for any extension of time which may be required to maintain the pendency of this case, and any required fee for such extension is to be charged to Deposit Account No. 19-4880.

Respectfully submitted,



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